

ELECTRODE DEVICE WITH INTEGRATED ELECTROLYTE SUPPLY FOR THE SURFACE TREATMENT
OF METALS

5 The invention concerns an integrated electrolytic acting torch for the surface
working of metals, or rather a device in which a peak-paddle is brought into
contact with the surface of the metal to carry out an operation of cleaning,
pickling, polishing, electrodepositing or permanent writing with oxidation
thereupon; with said torch integrated with the electrolytic action application
device.

10 The state of the art comprises various types of electrolytic action devices on
the surface of metals in which an electric current generating device is arranged
with two conductors: one in connection with the metallic surface and the other
connected to the localised action peak-paddle. Each device requires supply of
15 the electrolytic solution with regularity in order to allow said action to be carried
out.

It is known in the state of the art to dip the peak-paddle in cans of
electrolytic solution at regular intervals, to keep said peak-paddle wet which is
advantageously coated with a sheathing pad in porous but insulating material
20 so as to bring the electrolytic solution into contact with the surface of the metal
without allowing direct contact between the peak-paddle and said surface.

To avoid the dipping of the pad, supply devices of the electrolytic solution
with a pump from a tank arranged in the central body and separated from the
handle of the peak-paddle have been developed so as to constantly supply said
25 solution and to avoid overheating of the pad that would damage it.

Therefore, known devices are somewhat bulky and suitable for high
production, indeed, on them there are also suction devices for the fumes
generated in said electrolytic action.

30 In the field it is also known to use writing instruments with electrolytic action
on the surface of the metal. These devices do not have further characteristics of
use for a cleaning action of the metal, but allow just writing.

Therefore, from the state of the art various actions are known with
electrolytic action on the surface of the metals, but each device does not allow,
35 for reasons of bulk, cost and practicality, both the pickling, polishing and/or

Best Available Copy

cleaning action to be realised or even with a different solution, the writing and electrodepositing action.

Such state of the art is susceptible to numerous improvements with regard to the possibility of realising a device of simple construction, easy to use and of fairly low cost which allows use in the polishing and/or cleaning or even the writing and electrodepositing operations.

From this derives the need to solve the technical problem of finding a device for applying the electrolytic pickling, polishing and/or cleaning action, in an integrated manner with the same device which can also be used to carry out the writing and the electrodepositing. Last but not least said device must be of low bulk and easy to transport and, finally, must allow the easy and problem-free passage from one type of treatment to the other.

The invention solves the aforementioned technical problem by adopting: an integrated electrolytic acting torch for the surface working of metals, comprising a peak-paddle connected with the unipolar electric current supply from an external apparatus, the other pole being connected with the metal surface being treated, characterised in that it has the electrolytic solution used, for the specific treatment, arranged in a tank connected to said torch to supply said peak-paddle through channels inside said torch; the electrolytic solution is put under pressure in the delivery direction through a dosaging device of said solution controlled by the user.

Moreover, by adopting, in a further preferred embodiment, as a device for controlling the delivery of the electrolytic solution, a capillary passage, possibly with a slightly variable conical section, arranged in any point of the supply ducts and activated by pressure of the user on said tank.

Furthermore, by adopting, in a further preferred embodiment, as a device for controlling the delivery of the electrolytic solution, a sequence valve, arranged in any point of the supply ducts and activated by pressure of the user on said tank.

Moreover, by adopting, in a further preferred embodiment, as a device for controlling the delivery of the electrolytic solution, a manual pump with a mobile piston, arranged in any point of the supply ducts and activated by pressure of

the user on the body or shell of said torch.

Furthermore, by adopting, in a further preferred embodiment, associated with said pump with a mobile piston, at least one non-return valve arranged in the ducts between said piston and the tank.

5 Moreover, by adopting, in a further preferred embodiment, as a device for controlling the delivery of the electrolytic solution, a manual pump realised with the flexibility of the shell of said torch, arranged in any point of the supply ducts.

Furthermore, by adopting, in a further preferred embodiment, associated with said pump realised with a pair of non-return valves arranged one upstream and the other downstream of said flexible zone of the shell.

10 Moreover, by adopting, in a further preferred embodiment, said tank of the electrolytic solution removably connected with said torch.

Furthermore, by adopting, in a further preferred embodiment, said tank in which, connected inside, there is a filter permeable just to air or a capillary for the re-entry of air after the suction of the electrolytic solution.

15 Moreover, by adopting, in a further preferred embodiment, said tank of the type with a semi-rigid or flexible casing for the re-entry of air after spraying worked by the user.

Furthermore, by adopting, in a further preferred embodiment, said tank of the type with a rigid casing in which inside of it there is a mobile partition with a surface in contact with atmospheric pressure for the re-entry of air after the suction of the electrolytic solution.

Moreover, by adopting, in a further preferred embodiment, said tank of the type with a rigid casing in which inside of it there is a mobile partition with a surface in contact with a pressurised chamber to push upon said partition during the delivery to push the electrolytic solution.

Furthermore, by adopting, in a further preferred embodiment, said tank of the type with a rigid casing in which inside of it there is a mobile partition equipped with a union hole for a traction and return shaft of the partition, to realise the reloading of the tank with the suction of the electrolytic solution.

30 Moreover, by adopting, in a further preferred embodiment, said shell of the torch shaped to realise rigidifying zones thereof and zones with concentrated flexibility.

Furthermore, by adopting, in a further preferred embodiment, the shell shaped to realise a chamber on the central metallic body downstream of the

non-return valve.

Moreover, by adopting, in a further preferred embodiment, the shell shaped to realise a chamber upstream of the second no-return valve and at the most flexible zone of said shell.

5 Furthermore, by adopting, in a further preferred embodiment, said shell of the torch shaped to realise preferential sealing zones between the inside of the shell and the metallic body, through annular seats on said body and corresponding annular inner edges in the shell.

10 Finally, by adopting, in a further preferred embodiment, said shell of the torch shaped to realise preferential sealing zones between the inside of the shell and the metallic body, through annular grooves on the outside of the shell for the application of belt and locking rings of said shell.

15 A way of carry out the invention is illustrated, purely as an example, in the five attached tables of drawings, in which:

Figure 1 is a side view of the torch for the application of the electrolytic action on the surface of the metals according to a first version of the present invention;

Figure 2 is a longitudinal section of the torch of figure 1;

20 Figure 3 is a side view of a second embodiment of the torch for applying the electrolytic action according to the invention;

Figure 4 is a plan longitudinal section of the torch of figure 3;

Figure 5 is a longitudinal section of the shell in insulating and flexible plastic material of the torch of figure 3;

25 Figure 6 is a perspective view of the shell in insulating and flexible plastic material of the torch of figure 5;

Figure 7 is a longitudinal section of the body of the torch of figure 3 and thereafter to highlight the internal configuration thereof;

30 Figures 8 and 9 are section views analogous to figure 7 but with different supply tanks of the electrolytic solution to the torch;

Figure 10 is a section view of a simplified version of the torch according to the invention.

35 In figures 1 and 2, to represent a first embodiment of the invention, it is possible to see the body 1 of the torch from which the peak-paddle 2 projects,

for the electrolytic action on the metallic surface, applied to the piston 3 which can slide in the front part 4 of said body. In the rear part 5, the rigid or semi-rigid tank 6 for supplying the appropriate electrolytic solution and the supply cable 7 from the electrical generator, not shown, are applied to the body. In the body 1
5 there is a metal sleeve 8, advantageously made from acid-resistant stainless steel, for the union between the electric cable 7 and the piston 3, for which electrical continuity is ensured by the counter spring 9 of the piston 3, both in acid-resistant stainless steel. Said peak-paddle is equipped with a longitudinal cut 10 for the sliding of the electrolytic solution on the peak-paddle 2 and in the
10 pad, not shown. The solution present in the tank 6 is sucked by the movement of said piston 3 following the pressing of the peak-paddle 2 against the metallic surface. Indeed, the back and forth motion of the piston leads to the reduction in volume of the chamber 11 with the consequent push of the solution in the cut 10. A non-return valve 12 is present at the end of a duct 13 present axially to
15 the sleeve 8 and in connection to an axial hole 14 thereof directly connected to said tank 6 through the head 15 of said rear part 5. The head is equipped with a unipolar union 16 for the electrical cable 7, which electrically connects said cable with said sleeve 8; moreover, a capillary hole 17 on said head 15 allows the re-entry of air into the tank 6, as the electrolytic solution is dispensed.

20

In figures 3 and 4, to represent a second embodiment of the invention, it is possible to see the shell 18 in insulating and flexible coating material for the axial body 19 of the torch 20 to which the tank 21 is connected which releases the electrolytic solution into the first chamber 22 at the rear widening 23 of said
25 shell. The body 19, in the front part, has an axial hole 24 connected to said first chamber 22 and ending with a first non-return valve 25; axially to the body 19 there is a forepart 26 at a second chamber 27 and at the front widening 28 of said shell 18; said forepart is radially perforated at the two ends, the rear immediately downstream of said first non-return valve 25 and the front
30 immediately upstream of a second non-return valve 29, for the passage to and from said two non-return valves from the second chamber 27.

Said second chamber 27 has a more flexible zone 30 of the shell 18 to increase the volume of said chamber 27, to realise the variability of volume of said chamber in order to obtain the push of the electrolytic solution coming out
35 from said second non-return valve 29, after which the peak-paddle 2 is locked

with the clamp 31. To realise a good seal on said two chambers 22 and 27 the shell and the body, the forepart and the clamp have annular seats 32 in which inner edges 33 of said shell 18 engage. Moreover, at the clamp 31 the shell has an outer annular groove 34, for the insertion of a locking ring to complete the seal. The shell has the appendix 35 for the introduction of the delivery tube 36 from the tank 21. Said tube 36 is directly connected to said first chamber 22. Advantageously, the body 19, the forepart 26 and the clamp 31 are in acid-resistant stainless steel.

In figures 7, 8 and 9 it is possible to see different ways of realising said tank 21. Thus, in figure 7 said tank is closed on one side by a rigid end wall 37 on which a textile membrane filter 38 is arranged for just the re-entry of air, necessary during the delivery of the electrolytic solution; whereas in figures 8 and 9 it is possible to see a mobile partition 39, or 40 when equipped with a hole 41 for the union of a shaft end 42 for the return of said partition: said operation, when carried out with the tube 36 immersed, allows the suction of the electrolytic solution into the tank 21 from a container of greater capacity, so as to reuse the tank many times over.

In the case of the partition 39 it is also possible to apply a cover EC to the end of the tank and to introduce pressurised gas into the chamber G so as to obtain the push of the electrolytic solution independently from the pumping action carried out in any case. In this case the piston 3 or the more flexible zone 30 of the chamber 27 shall function like simple taps.

Finally, in figure 10 a further embodiment of the invention is represented, in which the simplified torch 43 has the peak-paddle 2 locked to the clamp 44 held in the front end 45 of the insulating shell 46. Inside the shell there is a perforated body 47 for connection with the head 15, to which the unipolar union 16 and the tank 6 are applied. Advantageously, the perforated body 47 and the clamp 44 are made from acid-resistant stainless steel. Said body allows the supply of the electrolytic solution to a sequence valve 48 for the dosaging of said solution. By pressing against the tank 6 the liquid is pushed through the sequence valve which, having reached a calculated pressure, allows the passage of said solution in the cut 10 and onto the peak-paddle 2. The capillary 17 then allows the re-entry of air into said tank 6. To replace the sequence

valve 48 it is possible to use a capillary hole of suitable section for the passage of the electrolytic solution.

5 The advantages obtained by this invention are: the combination of the torch and the tank connected to it allow the secure distribution of the electrolytic solution; moreover, the passage from one type of treatment to another with a different electrolytic solution is made much easier, the replacement of the tank with the corresponding electrolytic solution and a brief washing of the chambers and/or holes of the torch, amongst other things having a small volume, being
10 necessary; therefore, it is extremely versatile and easy to equip in the change of treatment; indeed, at the end of the pickling treatment the user is not left with contaminated electrolytic solution for dipping the peak-paddle with the pad. Furthermore, the delivery of the electrolytic solution in the version with a pump, of figures 1 and 2 or of figures 3 to 9, allows precise delivery without dripping,
15 as well as delivery under the head. Finally, the various forms of supply tanks of the electrolytic solution allow the realisation of disposable tanks or the realisation of reloadable or re-usable tanks with immediate reloading.

In practical use the materials, the sizes and the details can be different from those indicated, but technically equivalent to them, without for this reason
20 departing from the legal domain of the present invention. Thus, even if less advantageous, for the complications brought to the constructive simplicity of the forms of torch described, a unipolar switch integrated in the head and in the torch itself can be associated with the unipolar electric circuit, which crosses said torch in any of the embodiments, to interrupt the working current, without
25 having to act directly upon on-switches for the electrical source separate from the torch.

CLAIMS

1) Torch with integrated electrolytic action for the surface treatment of metals, comprising a peak-paddle (2) connected with the unipolar electric current supply (7, 16) from an external apparatus, the other pole being
5 connected with the metal surface being treated, characterised in that it has the electrolytic solution used, for the specific treatment, arranged in a tank (6, 21) connected to said torch to supply said peak-paddle through channels inside said torch; the electrolytic solution is put under pressure in the delivery direction through a dosaging device of said solution controlled by the user.

10 2) Torch, according to the previous claim, characterised in that it has as a device for controlling the delivery of the electrolytic solution, a capillary passage, possibly with a slightly variable conical section, arranged in any point of the supply ducts and activated by pressure of the user on said tank (6, 21).

15 3) Torch, according to the previous claim 1, characterised in that it has as a device for controlling the delivery of the electrolytic solution, a sequence valve (48), arranged in any point of the supply ducts and activated by pressure of the user on said tank (6, 21).

20 4) Torch, according to the previous claim 1, characterised in that it has as a device for controlling the delivery of the electrolytic solution, a manual pump with a mobile piston (3), arranged in any point of the supply ducts (13, 14) and activated by pressure of the user on the body (1) or shell of said torch.

25 5) Torch, according to the previous claim 4, characterised in that it has, associated with said pump with a mobile piston (3), at least one non-return valve (12) arranged in the ducts (11, 13) between said piston and the tank.

30 6) Torch, according to the previous claim 1, characterised in that it has as a device for controlling the delivery of the electrolytic solution, a manual pump realised with the flexibility of the shell (18, 27, 30) of said torch, arranged in any point of the supply ducts.

35 7) Torch, according to the previous claim 6, characterised in that it has said

pump realised with a pair of non-return valves arranged one upstream (25) and the other downstream (29) of said flexible zone (27, 30) of the shell (18).

5 8) Torch, according to one of the previous claims, characterised in that it has said tank (6, 21) of the electrolytic solution removably connected (5, 35, 36) with said torch.

9) Torch, according to one of the previous claims, characterised in that it has said tank in which, connected with the inside thereof, there is a filter (38)
10 permeable just to air or a capillary (17) for the re-entry of air after the suction of the electrolytic solution.

10) Torch, according to the previous claim 9, characterised in that it has said tank of the type with a semi-rigid or flexible casing for the re-entry of air
15 after spraying worked by the user.

11) Torch, according to one of the previous claims 1 to 8, characterised in that it has said tank of the type with a rigid casing (21) in which inside of it there is a mobile partition (39) with a surface in contact with
20 atmospheric pressure (37, 38) for the re-entry of air after the suction of the electrolytic solution.

12) Torch, according to the previous claim 11, characterised in that it has said tank of the type with a rigid casing (21) in which inside of it there is a
25 mobile partition (39) with a surface in contact with a pressurised chamber (G) to push upon said partition during the delivery to push the electrolytic solution.

13) Torch, according to the previous claim 11, characterised in that it has said tank of the type with a rigid casing (21) in which inside of it there is a
30 mobile partition (40) equipped with a union hole (41) for a traction and return shaft (42) of the partition, to realise the reloading of the tank with the suction of the electrolytic solution.

14) Torch, according to one of the previous claims 6, 7, characterised
35 in that it has said shell (18) of the torch shaped to realise rigidifying zones (23,

28) thereof and zones with concentrated flexibility (30).

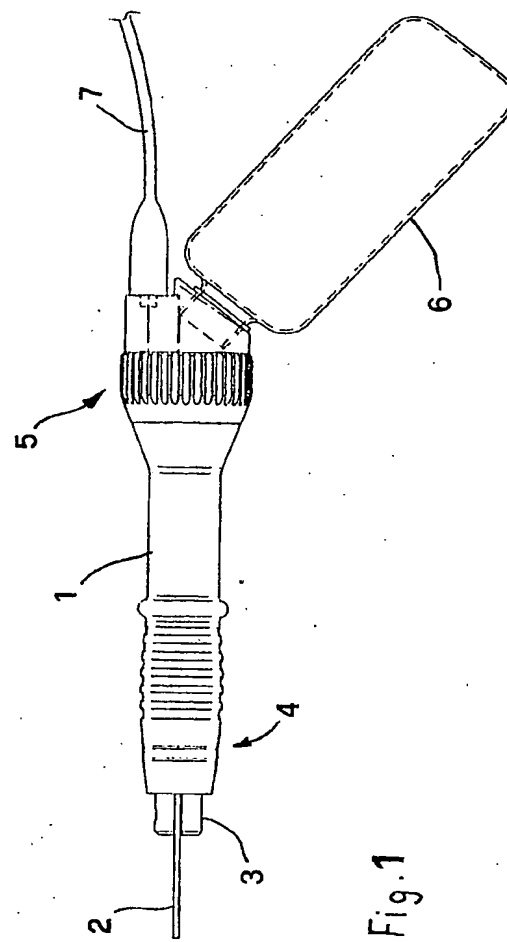
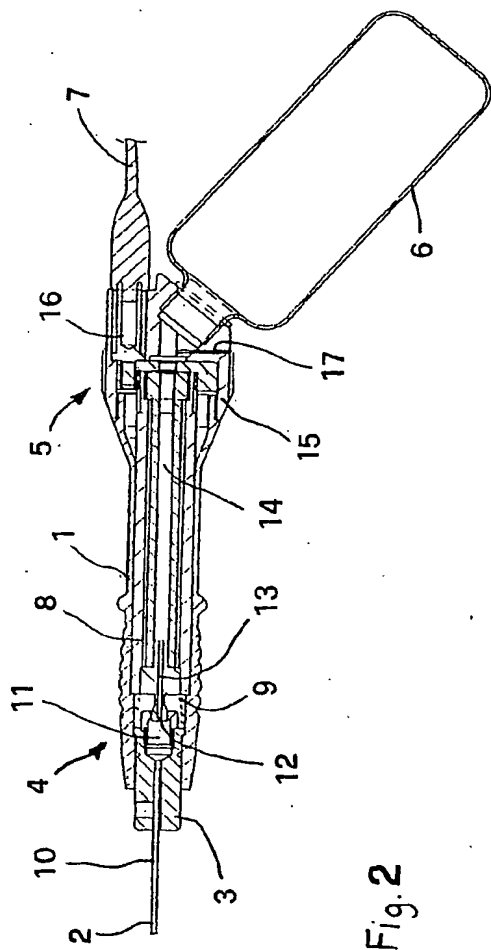
15) Torch, according to the previous claim 14, characterised in that it has the shell (18) shaped to realise a chamber (22) on the central metallic body of the torch upstream of the non-return valve (25).

16) Torch, according to the previous claim 15, characterised in that it has the shell (18) shaped to realise a chamber (27) at the second no-return valve (29) and at the most flexible zone (30) of said shell.

17) Torch, according to one of the previous claims 14 to 16, characterised in that it has said shell of the torch shaped to realise preferential sealing zones (32, 33) between the inside of the shell and the metallic body, through annular seats (33) on said body and corresponding annular inner edges (32) in the shell.

18) Torch, according to one of the previous claims 14 to 16, characterised in that it has said shell (18) of the torch shaped to realise preferential sealing zones between the inside of the shell and the metallic body, through annular grooves (34) on the outside of the shell for the application of belt and locking rings of said shell.

1/5



2/5

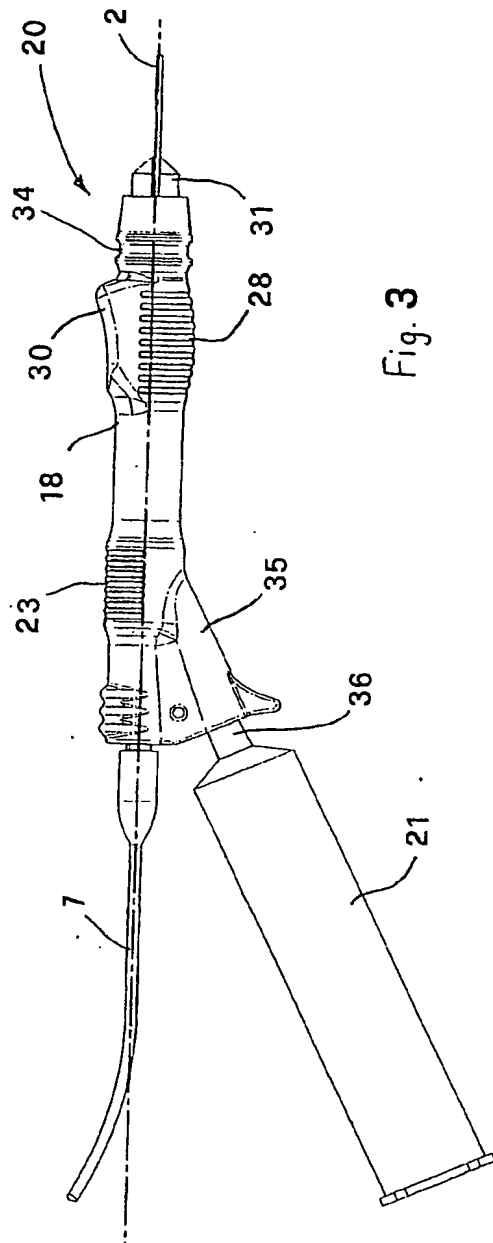
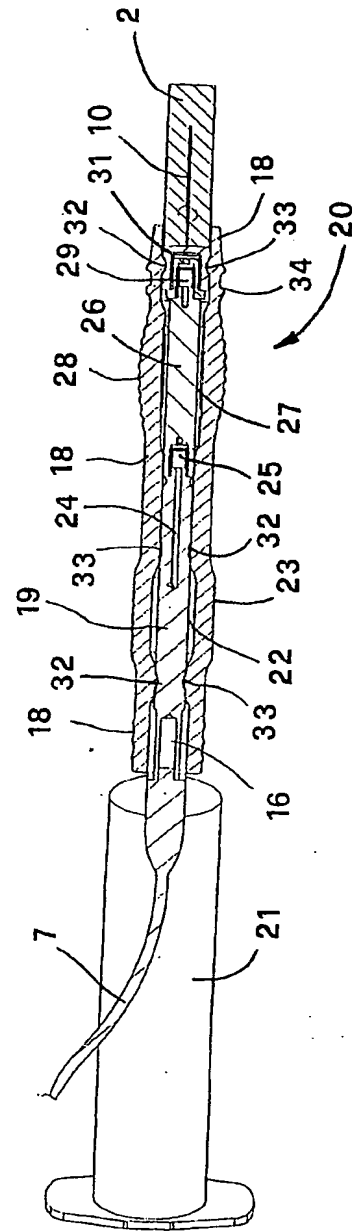


Fig. 3

Fig. 4



3/5

Fig. 6

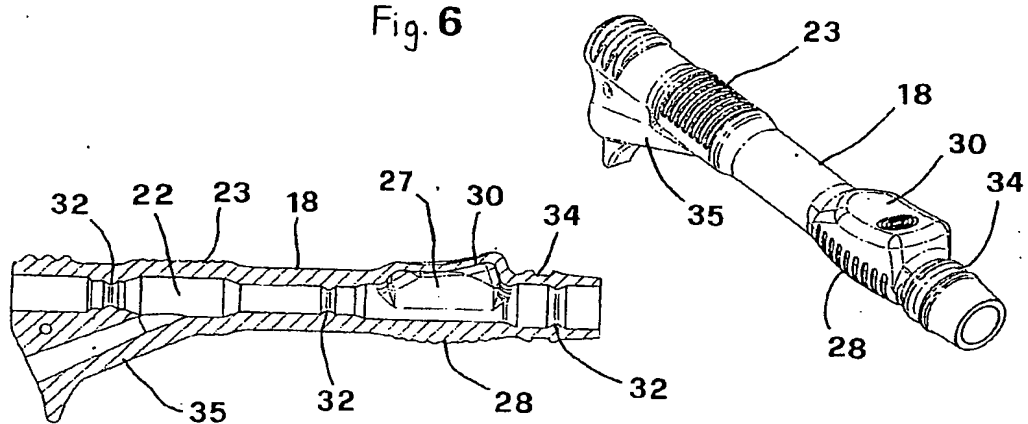
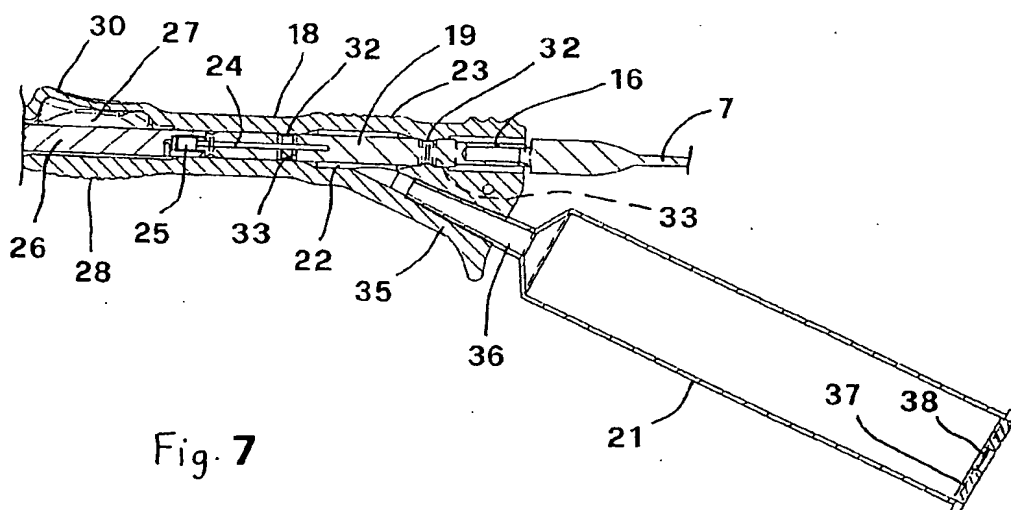


Fig. 5



4/5

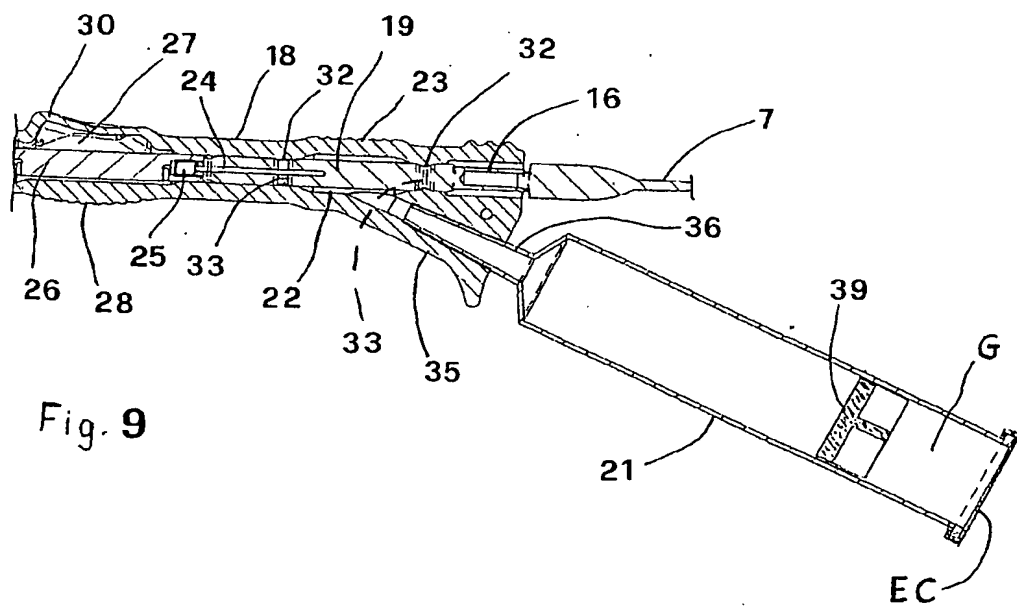
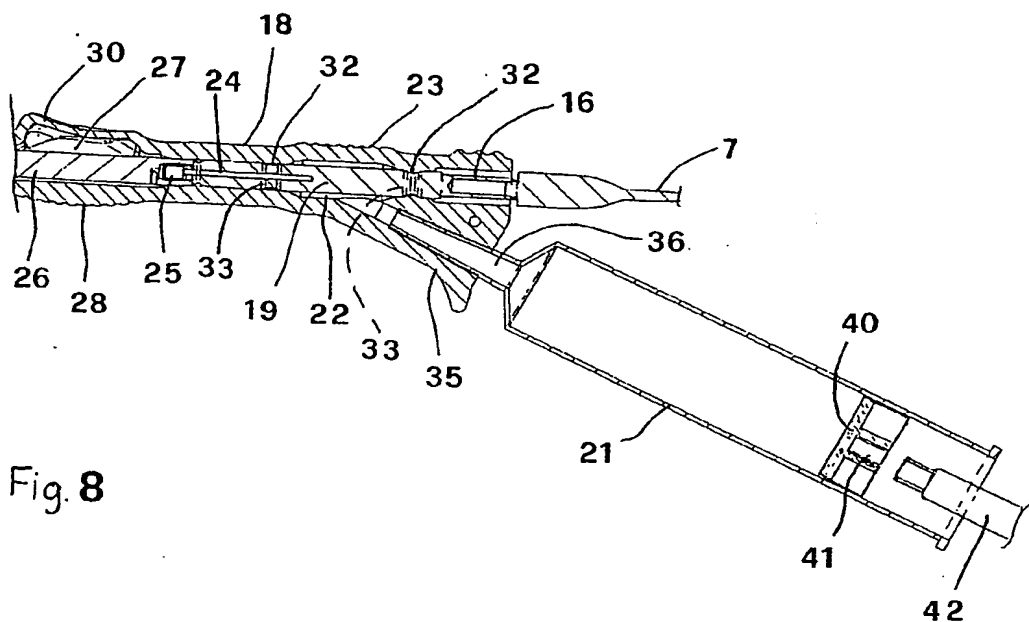
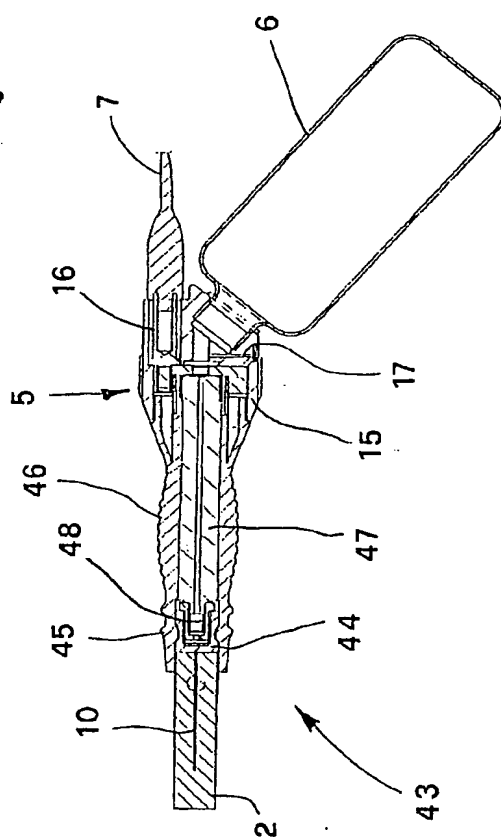


Fig. 10



INTERNATIONAL SEARCH REPORT

Intern. Pat. Application No

PCT/IT 03/00647

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C25D17/14 C25F7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C25D C25F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CH 130 909 A (BERNARD LOUIS) 15 January 1929 (1929-01-15) page 1, left-hand column, lines 1-14; figure 4 page 2, left-hand column, lines 27-46	1,2
X	US 2 798 849 A (LINDSAY ALLEN R) 9 July 1957 (1957-07-09) column 2, line 28 - column 3; line 47; figure 2 column 4, lines 58-65	1,2
X	DE 38 34 035 A (GUT GES UMWELTSCHONENDE TECH) 12 April 1990 (1990-04-12) column 2, lines 7-35; figure 1	1,3
	----- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"Z" document member of the same patent family

Date of the actual completion of the international search

24 January 2005

Date of mailing of the international search report

02.03.05

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Hammerstein, G

INTERNATIONAL SEARCH REPORT

Internat. Application No.
PCT/IT 03/00647

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 85 13 410 U (LAIDEMITT, K.-D.) 7 November 1985 (1985-11-07)	1
A	page 6, line 23 - page 7, line 7; figure 4 -----	2,3
X	DE 11 30 245 B (METRIMPEX MAGYAR MUESZERIPARI) 24 May 1962 (1962-05-24) column 2, line 42 - column 4, line 7; figures 1,4 column 5, lines 54-68 -----	4
X	US 3 346 477 A (WOLFER HARNISCH P) 10 October 1967 (1967-10-10) column 1, line 72 - column 3, line 4; figures 1,2 -----	6,14
X	US 828 814 A (CUNNINGHAM, FRANK) 14 August 1906 (1906-08-14) page 1, right-hand column, lines 5-104; figures 1,2 -----	6,14
X	DE 40 18 649 A1 (CLASEN, HERMANN, DIPL.-CHEM. DR., 6240 KOENIGSTEIN, DE) 12 December 1991 (1991-12-12) page 3, line 59 - page 4, line 19; figures 1,5; example 4 page 9, lines 10-13 -----	6,14

INTERNATIONAL SEARCH REPORT

in international application No.
PCT/IT 03/00647

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
1-7, 14-18
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-3

Claims 1-3 are directed towards an electrode device for the electrolytic surface treatment of metals, comprising a nozzle connected with a unipolar external power source, a tank for electrolytic solution connected to the said electrode device in order to supply the nozzle through channels inside said device with electrolytic solution which is put under pressure through a dosing device controlled by a user, the said dosing device being activated by pressure of the user on the tank.

2. claims: 4-7 and 14-18

Claims 4-7 and 14-18 are directed towards an electrode device for the electrolytic surface treatment of metals, comprising a nozzle connected with a unipolar external power source, a tank for electrolytic solution connected to the said electrode device in order to supply the nozzle through channels inside said electrode device with electrolytic solution which is put under pressure through a dosing device controlled by a user, the said dosing device being activated by pressure of the user on the body or shell of the electrode device.

3. claim: 8

Claim 8 is directed towards an electrode device for the electrolytic surface treatment of metals, comprising a nozzle connected with a unipolar external power source, a tank for electrolytic solution connected to the said electrode device in order to supply the nozzle through channels inside said device with electrolytic solution which is put under pressure through a dosing device controlled by a user, the said tank being removably connected to the said electrode device.

4. claims: 9-13

Claims 9-13 are directed towards an electrode device for the electrolytic surface treatment of metals, comprising a nozzle connected with a unipolar external power source, a tank for electrolytic solution connected to the said electrode device in order to supply the nozzle through channels inside said device with electrolytic solution which is put under pressure through a dosing device controlled by a user, the said tank being defined by its features for re-entry of air after the suction of the electrolytic solution.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/IT 03/00647

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
CH 130909	A	15-01-1929	NONE	
US 2798849	A	09-07-1957	NONE	
DE 3834035	A	12-04-1990	DE 3834035 A1 AU 4522289 A DE 3901976 A1 WO 9004052 A1	12-04-1990 01-05-1990 26-07-1990 19-04-1990
DE 8513410	U	07-11-1985	DE 8513410 U1	07-11-1985
DE 1130245	B	24-05-1962	NONE	
US 3346477	A	10-10-1967	NONE	
US 828814	A		NONE	
DE 4018649	A1	12-12-1991	DE 4118911 A1 WO 9119833 A2 EP 0489875 A1	10-12-1992 26-12-1991 17-06-1992

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☒ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.